

LOW COST PORTABLE SENSORS FOR MEASURING TRAFFIC RELATED AIR POLLUTION IN TUNNEL



PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21-CMP11

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In this work, low cost portable sensors are used to measure traffic related air pollution in tunnel within the framework of the research operation "SERRES". The objective of this research operation is to produce recommendations and solutions to limit the impact of road traffic on the environment. Within this research operation, low cost pollution portable sensors are characterized and air pollution measurement are correlated with the traffic data of the tunnel.

PRELIMINARY TESTS

➤ A full set of preliminary tests was realised in laboratory to evaluate the portable sensor reliability and to analyze its performances in terms of accuracy, autonomy and memory capacity.



Photo 1 - Bench Test



Photo 2. Thermal test



Photo 3. Test in the outside

DYNAMIC TESTS

➤ The portable sensors were fixed to a static traffic measurement station close to a road. The two sensors were installed for 24 hours. The traffic data recorded by the traffic station were used to analyze the link between traffic condition and air pollution. A correlation between the road traffic condition and the evolution of the air pollution was verified.



Photo 4. Dynamic bench test

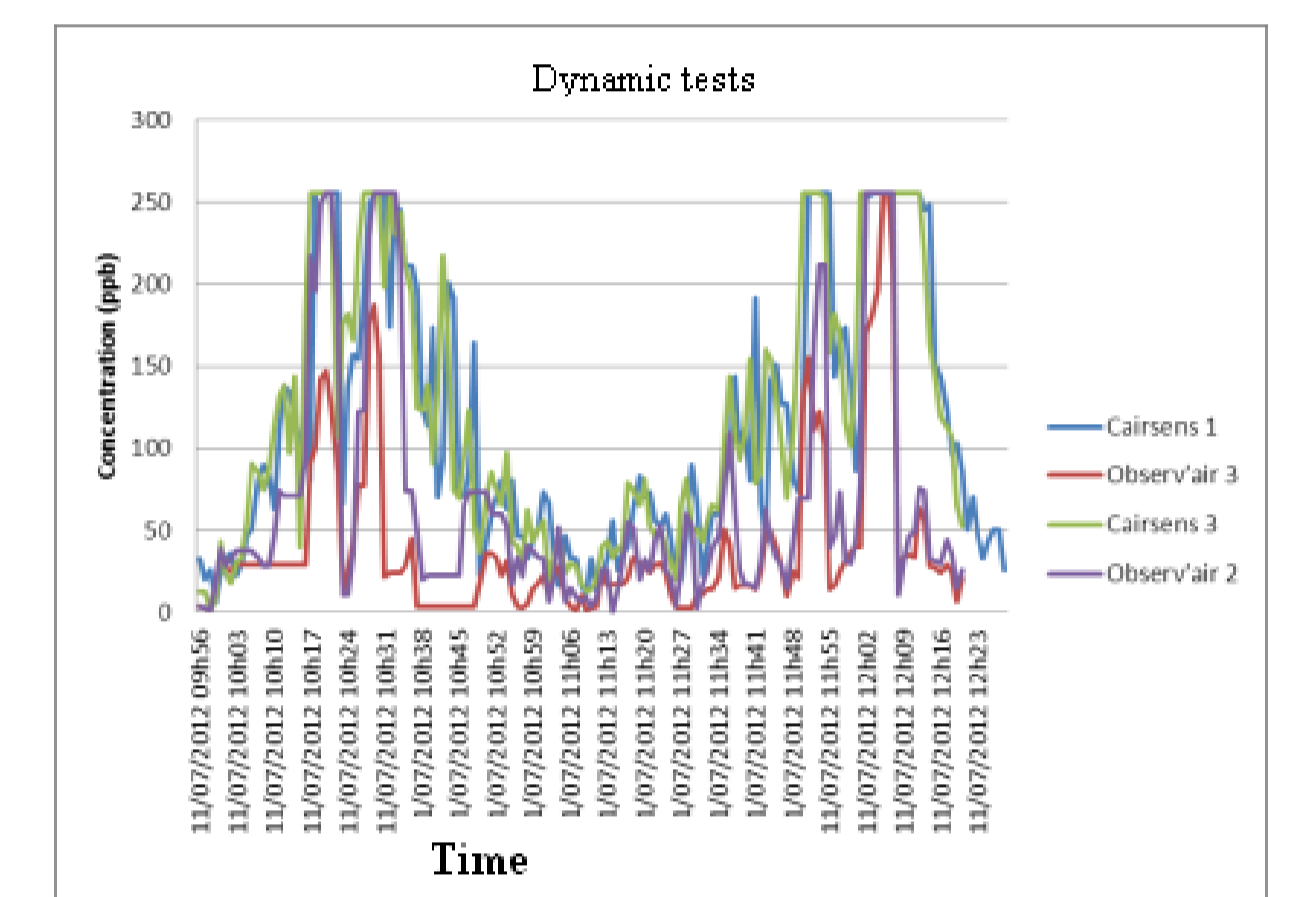


Figure 1 - Dynamic tests results

SELECTION AND INSTRUMENTATION OF THE TUNNEL

➤ The Guy Môquet tunnel was selected as an experimentation site because it had the following characteristics: easy instrumentation, simple access and close to a static traffic measurement station. The tunnel is located in the Val-de-Marne district of south-east Paris. An instrumentation was realized inside the tunnel in collaboration with the Ile de France territorial division unit in charge of air quality. It involved placing and instrumentating four pollution portable sensors inside the tunnel.



Photo 5 - Installation of the pollution sensors in the Guy Môquet tunnel

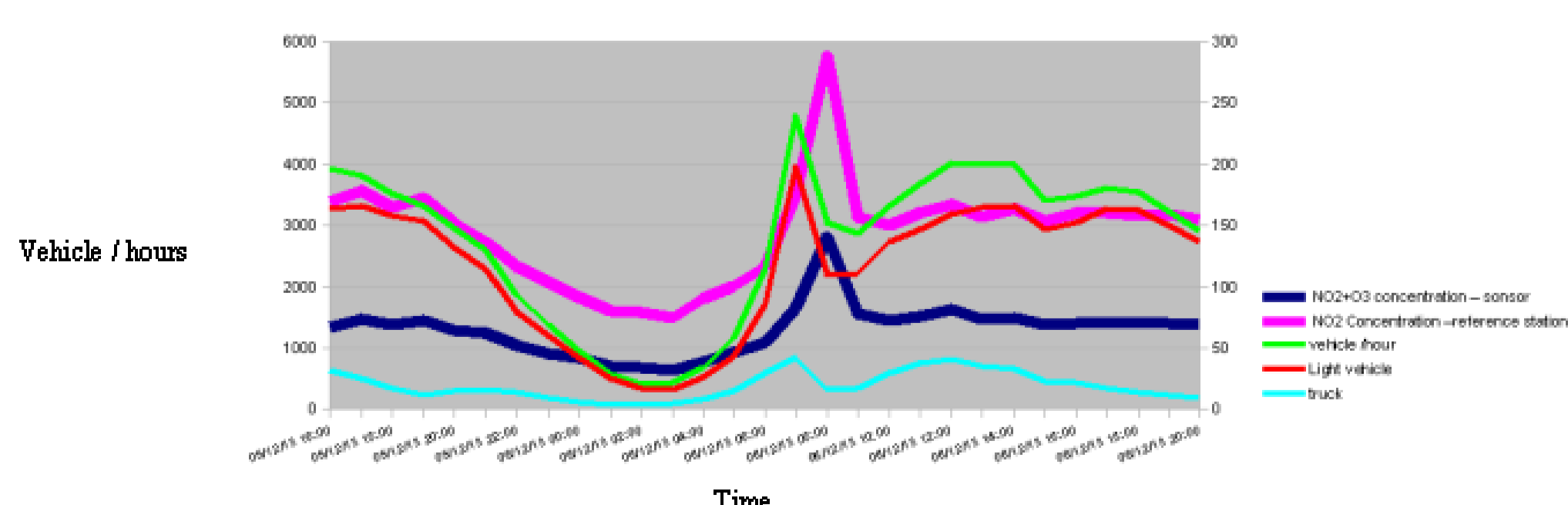


Figure 2 - Results of the tests in the tunnel

AIR POLLUTION MEASUREMENT DUE TO ROAD TRAFFIC

➤ The aim of these tests is to correlate the evolution of the pollution with the road traffic condition. Two sensors were chosen for their performances based on the preliminary tests. One Observ' air sensor and one Cairsens sensor were fixed to a road traffic study station. They were installed close to a road for 24 hours.

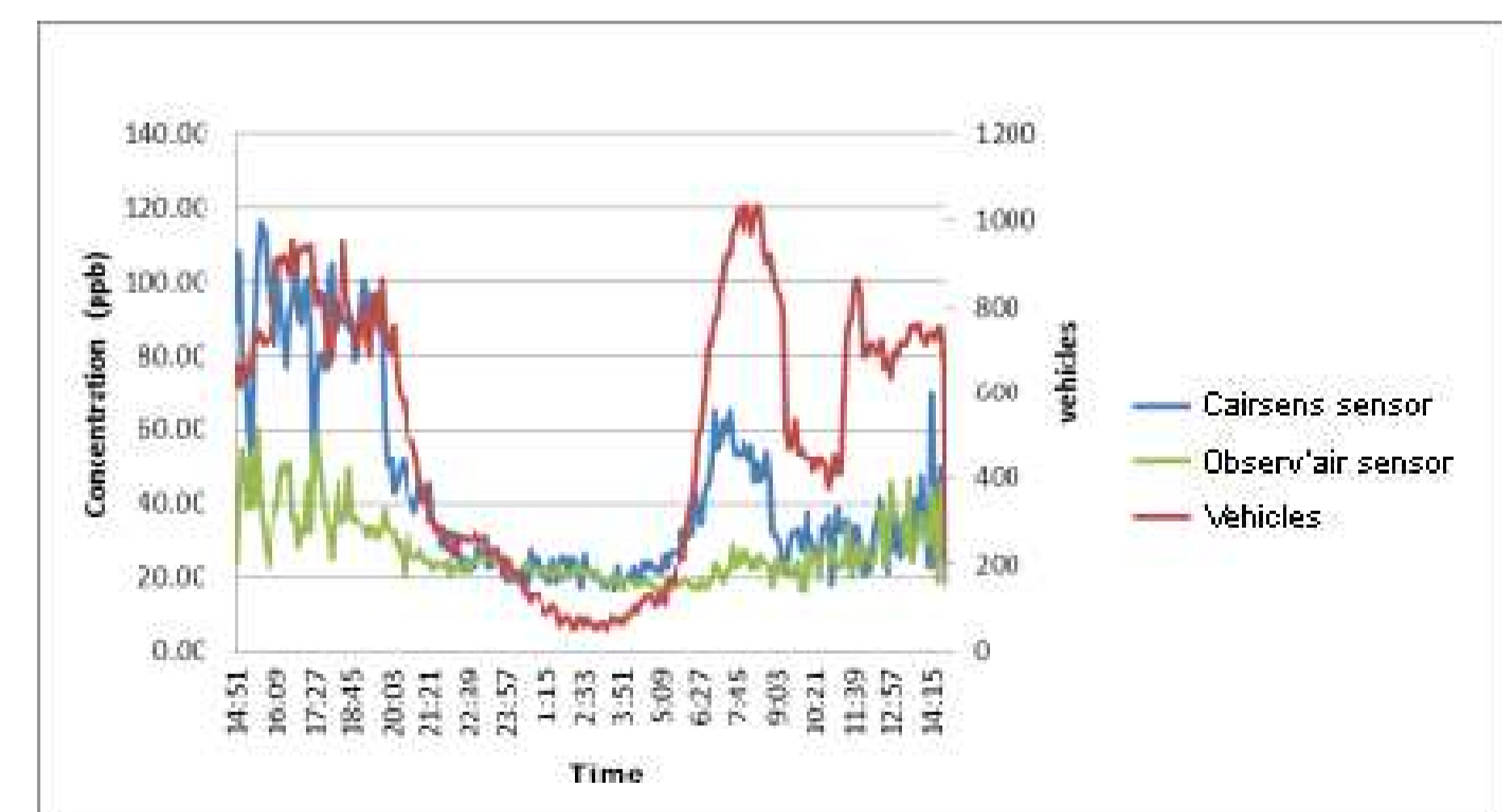


Figure 3 - Evolution of the average concentration of NO₂ and total number of vehicles according to the time

Conclusion

We found that the two types of sensors can measure changes in the concentration of NO₂ over time. It should be noted that the sensors we tested, had a measurement range from 0 to 250 ppb and that there is a version of the sensors with a range between 0 and 5 ppm available by special request. It would then be possible to make measurements on sites which can be heavily polluted. By placing the sensor near a traffic station, these different tests have clearly proved the link between pollutant concentrations and road traffic.

Aknowldgment

This works is supported by the Technical Division for Territorial Development and Urban Planning of the CEREMA